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ABSTRACT

The Information Environment for School Leadership Preparation (IESLP) is a Web-based instructional system for educational administration preparation programs. The Web site presents a virtual rural school environment: a database of an actual rural school (using pseudonyms) containing information about students, teachers, school board members, test scores, curriculum, policies, and community demographics. It also presents problems that students are to address as school administrators. In an evaluation of the program, students were presented with a scenario concerning parent complaints about low student test scores. Students were organized into teams of four and required to prepare an analysis of student test scores and recommendations for a school improvement plan. Results indicated that after using IESLP, students tended to have a broader perspective on their approaches to decision making in that problems were more apt to be identified in terms of the total organization. Students showed a greater awareness of the use of many different kinds of data, not just peoples' perceptions, as essential sources of information for decision making. Students continued to value participatory decision-making but also indicated the need for people in the organization to possess the necessary information and data to make good decisions. Students reported gains in their professional use of technology in all areas, but especially in the use of spreadsheets and databases. Implications for educational administration preparation and professional development are discussed. (TD)

**Technology Tools for Data-Driven Decision Making:
Promising Professional Development for Rural School Leaders**

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Technology Tools for Data-Driven Decision Making: Promising Professional Development for Rural School Leaders

Information technology is altering school environments and the nature of teaching and administering schools. The ability to access, interpret, and analyze previously unavailable information for the purpose of improved data-driven decision making and increased responsiveness regarding student achievement, curricular trends, budget expenditures or other aspects of schooling provides school leaders an opportunity to work smarter toward accomplishing a variety of school improvement goals.

Much attention has been given to closing the digital gap between teachers and students, yet little effort has been exerted to address the professional development of educational leaders in terms of applying technology to administrative functions. An exception is the Information Environment for School Leader Preparation (IESLP) project, a web-based instructional system designed for educational administration preparation programs. This innovative approach to educational leadership training contains a virtual rural school database containing information about students, teachers, school board members, test scores, curriculum, policies, and community demographics.

THE IESLP WEB SITE

The Information Environment for School Leadership Preparation (IESLP) [URL: <http://ieslp.coe.missouri.edu>] was developed by the University Council for Educational Administration as a problem-based instructional system for preparing leaders of educational organizations. The IESLP web site consists of three major

components: (a) a rural school environment; (b) student exercises; and (c) communication tools. In addition, the site contains instructor and student resources, guides, and tutorials and has the capability of archiving student responses for future on-line access by instructors. The school environment, named Crawford Public Schools, is a virtual school containing the types of data normally available to school administrators. The IESLP environment consists of a complete student database for approximately 300 students, K-12, including demographic information, grades, transcripts, and one year's test scores. Other data provided are teacher and school board member profiles, financial and budget information, information on plants and facilities, maps and bus routes, school board policies, and a context appraisal report done for Crawford Public Schools by an outside consultant. Additional information is available about the community of Crawford, including such items as economic and demographic data, which might be available about any given community via the U. S. Census and/or a community's web page. The Crawford Public School data is real and was collected from a small, rural school for the IESLP project. Pseudonyms replaced all actual names of the community, students, teachers, and others.

Student exercises, termed catalysts, are intended to serve as a starting point for utilizing the data from the virtual school environment. Catalysts typically present a problem or situation that students are to address as Crawford Public School administrators. Although similar to case studies and in-basket simulations used in educational administration preparation programs, the IESLP exercises differ from these approaches in that the problems are presented within the

specific school context of Crawford Public Schools. Because the rural school data is real, students are forced to examine available data to analyze the problem and sometimes find that desirable data for decision-making is not always available.

THE FUNCTION OF DECISION MAKING IN LEADERSHIP

Classical theorists approached decision-making as a rational and deliberate process undertaken by a single authority, whereas shared decision-making theories proposed that leaders facilitate organizational decisions through the involvement of others. While participatory decision-making more accurately reflects the realities of administrative practice, both perspectives offer important frameworks for the student of educational administration. Rational models of decision-making are goal-oriented and delineate a series of stages, such as:

1. Identify the problem.
2. Define the problem or issue.
3. Analyze the difficulties in the existing situation and determine alternatives.
4. Establish criteria for problem resolution.
5. Develop a plan or strategy for action.
6. Initiate the plan of action.
7. Evaluate the effectiveness of the decision. (Hoy & Miskel, 1996 ; Lipham, 1974)

Participatory decision making theory added to this sequential process by introducing the notion of "interaction of power and influence" (Owens, 1995, p. 189) of the administrator and others in the organization. Tannenbaum and

Schmidt (1973) suggested that participatory decision-making involves a continuum of involvement. At the highest levels of participation the administration and others collaborate on defining the problem itself as well as working together to arrive at a mutually agreeable decision, while at lower levels of participation the administrator not only defines the problem but may limit participation to "selling" his/her decision to others or having others respond to the administrator's solution. Thus, participatory decision-making involves answering the question of who should participate. Bridges (1967) suggested that teachers should participate when the problem is relevant to teachers' functions, such as teaching methods, curriculum, and discipline, and if the teachers possess the expertise to contribute effectively to the decision. Schneider (1984) found that a linear relationship existed between teachers' level of involvement in decision making and their job satisfaction. Her research suggested that teachers desired involvement not only in instructional issues but also in schoolwide managerial matters.

Furthermore, decision making in the context of school improvement must be viewed from an open systems perspective. Louis, Toole, and Hargreave (1999) illuminate the complexity of school improvement in their identification of eight characteristics of educational problems. These were

1. Lack of a definitive formulation of school improvement
2. Interconnectedness of educational and social problems
3. Multiple explanations for every aspect of the problem
4. Indeterminate links between cause and effect

5. Solutions dependent upon diagnosis of the problem
6. No simple way to test alternative solutions
7. Multidimensional problems which overlap other problems
8. Lack of closure due to open-ended problems which need constant attention (p. 256).

Another aspect which complicates decision making for school improvement is the fact that decisions are not relegated to a single office. Johnson (1996) noted that a number of participants are engaged in defining problems, identifying solutions, and mobilizing support for new ideas and initiatives. Carter and Cunningham (1997) pointed to the multiplicity of participation in decision making when they stated the keys to being an effective superintendent are "open communication, integrity, hard work, positive direction, core values, sound judgment, and effective decision making. Superintendents should strive to ensure that they clearly understand the diverse interests involved in each decision and are well informed" (p. 36).

The intricacies of decision making are difficult to convey through conventional instructional approaches such as lecture, reading, and discussion. Decision making requires both a knowledge base of organizations and educational issues as well as skills in facilitation, communication, and conflict resolution. Decision making is a process that must be practiced and is learned and refined through experience. The IESLP environment provides educational administration professors an experiential mechanism to teach students about the complexities of decision making.

IESLP FIELD TESTING

Decision-making skills encompass both cognitive processes and interactive group processes with a variety of stakeholders. This framework of decision making processes served as a focus for investigating how students' perceptions and metacognition relative to decision-making might be effected as a result of their involvement with IESLP. The computer technology component of IESLP was also viewed as an essential element of the decision-making process. One primary purpose of IESLP was for students to use "computers as they do or will in their actual work-lives. That is, students use computers as tools to retrieve information and data, analyze data, communicate, and produce products" (Mayer, Crawford, & Forsyth, 1998, p. 5).

In order to evaluate the effect of IESLP as an instructional tool for administrative preparation and specifically decision-making skills, a survey was developed to collect data prior to and after the use of IESLP. In addition, students were asked to provide formal reflective statements regarding their perceptions of learning through IESLP. In the spring of 1999, the Department of Educational Leadership at the University of Nevada Las Vegas participated in a beta test of IESLP.

The IESLP program was field tested in an 8-semester hour course block that integrates Supervision of Instruction, Administration for Curriculum Improvement, and two one-credit hour field experiences related to instructional supervision and curriculum leadership. In utilizing IESLP as a learning medium in this course block, a deliberate assumption was made that students possessed

basic skills in computer technology in terms of word processing and web-based searching and had at least a rudimentary familiarity with the functions of databases and electronic spreadsheets. This assumption was shared with students, and students were invited to help one another with technological skills and encouraged to explore spreadsheets on their own. This approach to instruction was a decision deliberately made, based on research that shows that collaboration and self-pacing are compatible to adult learning styles, especially when learning new computer technology (Stites, 1998; Wood, Thompson, & Russell, 1990). Furthermore, as a field test it was important to examine the practicality of incorporating IESLP as an instructional tool in existing educational leadership courses. An additional expectation was that students would pursue work on IESLP outside of class, from home or school computer access. No additional class time in the computer lab was provided for students.

Students were introduced to IESLP through the utilization of one of the catalyst problems available on the IESLP web site, entitled "Community Involvement: A Two-Edged Sword" (Chance & Chance, 1998). This catalyst presents a scenario where parents have lodged complaints with the administration and school board regarding Crawford Public School's student test scores. Parent complaints allege that scores are too low and that students are not being adequately prepared for college. The problem and the web site were both presented during a single, four-hour class period held in a computer lab. The instructor began the demonstration of the IESLP web site by having students log in and locate the Crawford Public Schools home page and menu. An in-depth

demonstration of the student database and test data was given, showing students how to download data and access data through spreadsheet software. Minimal instruction was provided regarding the actual use of electronic spreadsheets or the manipulation of data within the spreadsheets. Students were given approximately 45 minutes to an hour to explore the IESLP web site at individual workstations and to receive individual assistance from the instructor.

Students were then organized into teams of four and a simulated context was provided for the introduction of the problem catalyst. Each group was given the task of role playing an administrative team consisting of two elementary co-principals and two secondary co-principals, in order to be consistent with the Crawford Public School setting. Teams were given two tasks: (a) to prepare an analysis of student test scores, and (b) to prepare recommendations in the form of a school improvement plan that would eventually be presented to the Board of Education. Both reports were to be presented to the Superintendent (role-played by the instructor) in a simulated administrative team meeting.

RESULTS

The survey administered to students prior to and after their use of IESLP included six open-ended questions, as follows:

1. How do you recognize something as problematic?
2. What steps do you take to solve a problem?
3. What do you think will be some of the most challenging administrative problems in the next five years?
4. As an administrator, what kinds of information would be of most value to you in solving problems?
5. What sources of information do you anticipate using as an administrator when faced with solving a problem?
6. In making an administrative decision, what factors or criteria should be taken into account?

In addition, students were asked to rate their use of various computer technology tools using a scale from 1 to 5, where 1 indicated the respondent never used this technology and 5 indicated consistent use. Students rated their use of the following: (a) e-mail; (b) spreadsheets; (c) databases; (d) word processors; (e) conducting ERIC searches; (f) conducting web searches; (g) accessing information from government web sites; (h) accessing information from professional organization web sites; accessing information from online library databases.

Decision Making

Two significant themes relative to decision-making emerged from an overall examination of the data collected before, during, and after the IESLP beta tests. First, considerable differences in students' approaches to decision-making were evident. Prior to the use of IESLP, students' identification of problems was primarily feeling-based. That is, situations and events were seen as problematic if people were unhappy, frustrated, or negative. In addition, students indicated that their primary sources of information to solve problems would be gathered from various people in the organization, usually from those involved in the identified problem. After using IESLP, students tended to have a broader perspective on their approaches to decision-making. Problems were more apt to be identified in terms of the total organization, that is goals not being achieved. The data clearly revealed that after using IESLP students showed a much greater awareness of the use of many different kinds of data, not just peoples' perceptions, as essential sources of information for decision-making. This shift in

perspective is, of course, a primary objective of educational administration preparation programs. Aspiring administrators must be moved beyond the walls of the classroom that provide their experience base to view the bigger picture of the school as an organization. IESLP is certainly an appropriate vehicle for facilitating this process.

A second important theme regarding decision-making concerned the involvement of others in the decision-making process. Because IESLP embroils students in data, it could be anticipated that this might result in students relying so heavily on data-driven decision-making that human relation factors within the organization may be slighted. This was not the case in these field tests. Post-survey results showed that students continued to value participatory decision-making but also indicated the need for people in the organization to possess the necessary information and data to make good decisions.

Technology Use

Data from pre- and post-instruction surveys indicated significant differences in students' comfort level with using various computer technologies. Students reported gains in their professional use of technology in all areas. The lowest pre-simulation responses were in the use of spreadsheets and databases, with a mean rating of 2.10 and 2.29 respectively. Student use of these tools also showed the highest gains in the post-simulation survey. After using IESLP, students' mean response to their use of electronic spreadsheets was 2.96, an average gain of .86, and the mean response to using databases was 3.17, an average increase of .88. Substantial gains were also reported in students' use of

technology for web searches, specifically the use of professional organizations' and government web sites. Table 1 summarizes the pre- and post-instructional survey responses regarding students' utilization of various technological tools.

Table 1. Mean Responses to Professional Use of Computer-based Tools

Tool	Pre-Instruction Mean	Post-Instruction Mean	Difference
E-Mail	3.96	4.38	+.42
Spreadsheet	2.10	2.96	+.86
Database	2.29	3.17	+.88
Word Processor	4.67	4.96	+.29
ERIC Search	2.52	3.00	+.48
Web Search	3.29	3.85	+.56
Searching Government Web Sites	2.50	3.13	+.63
Using Professional Web Sites	2.73	3.52	+.79
Online Library Databases	2.56	2.79	+.23

IMPLICATIONS FOR EDUCATIONAL ADMINISTRATION PREPARATION AND PROFESSIONAL DEVELOPMENT

The IESLP project shows promise as an instructional tool for preservice and inservice training for educational leaders by its integrated use of technology to facilitate data-driven decision making. Students' personal reflections regarding IESLP as a learning tool pointed out its benefits in areas

such as problem identification, problem solving, decision making, data analysis, and collaboration. One student team observed that the IESLP simulation "provided a safe environment in which to practice our skills . . . and let us make mistakes without impacting students." Regarding specific technological tools, one group wrote: "IESLP was a valuable learning experience as a future administrator as it allowed us to utilize a database to gather information. We used a spreadsheet to organize and analyze test scores and student data." Another team stated that "the application of technology forced us to learn how to access data, create a spreadsheet, and design graphs."

The effect of IESLP, however, went beyond technological application. One team noted: "IESLP was a real world experience that placed us in an administrative role incorporating realistic challenges and decision-making opportunities." Another team noted the benefits of collaboration and critical feedback: "We presented our collaborative projects in a simulated administrative-superintendent meeting where our supervisor gave us critical feedback and caused us to rethink our decisions." Students further recognized the value of data and the implications when data is not readily available, as noted in the following comment: "The inability to access data and the mistakes found along the way allowed us the opportunity to utilize our problem-solving skills."

The potential for this type of web-based instructional tool extends beyond preservice applications. The IESLP project offers a promising prototype for delivering inservice training to rural school principals. In the last decade, federal and state initiatives related to technology, curricular improvement, and

development of infrastructure have resulted in increasing rural schools' access to technology. While the primary focus for technological development in rural schools has been on student learning and access to e-based information, the utilization of technology by leaders in rural schools should not be overlooked. Electronic data management can become an invaluable tool in making thoughtful, deliberate decisions about school improvement. In the current era of public demand for school accountability, rural schools should not rely solely on data supplied and analyzed by state agencies functioning in an oversight capacity. Instead, rural school leaders must take charge of data about their own schools in order to tell their own story.

School districts collect and store a great deal of information. Some is used for district purposes; other data is collected for state or federal reporting purposes. More often than not data is collected and stored in a piecemeal fashion and access to data is difficult. Thus, the information collected is used only for perfunctory tasks or required mandates. Thorough analysis of data is often lacking in administrative decisions regarding curriculum, instruction, or financial expenditures due to the lack of time and resources needed to aggregate data. Kongshe (1999) noted, "Too often, the school district's own data is not accessible in a useful form to the people who need it most" (p. 14).

With technology applications becoming increasingly available to rural schools, thought should be given to the systematic development of electronic data storage for school management. The IESLP project provides a prototype for rural school data management and offers a mechanism for establishing on-

line professional development to teach administrators how to manage and use data for making decisions about school improvement.

Careful attention and analysis of data not only leads to better educational decisions that benefit students but also documents and supports schools' effectiveness. The public's call for school accountability has resulted in legislative mandates which generally call for a simplistic reporting of data, such as average attendance or average student test scores, which reveal little useful or relevant information. The IESLP project presents an e-model for offering professional development to rural school administrators and can help leaders learn how to utilize computer technology applications to make data-driven decisions. In addition to school improvement efforts, rural school leaders can learn to use data in a public relations effort to define and explain their school's effectiveness to their stakeholders.

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